BEFORE THE STATE OF NEW JERSEY
OFFICE OF ADMINISTRATIVE LAW

I/M/O THE PETITION OF NUI UTILITIES, INC	**)**	
D/B/A ELIZABETHTOWN GAS COMPANY	**)**	**BPU DOCKET NO. GR02040245**
FOR APPROVAL OF INCREASED BASE	**)**	**OAL DOCKET NO. PUC 3719-02**
TARIFF RATES AND CHARGES FOR GAS	**)**	
SERVICE AND OTHER TARIFF REVISIONS	**)**	

DIRECT TESTIMONY OF BASIL L. COPELAND
ON BEHALF OF THE
NEW JERSEY DIVISION OF THE RATEPAYER ADVOCATE

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Filed: September 6, 2002

I. BACKGROUND AND QUALIFICATIONS

Q. PLEASE STATE YOUR NAME, BUSINESS ADDRESS AND TELEPHONE NUMBER.

A. My name is Basil L. Copeland, Jr. My business address and telephone number are 14619 Corvallis Road, Maumelle, AR, 72113.

Q. WHAT IS YOUR OCCUPATION, BY WHOM ARE YOU EMPLOYED, AND FOR WHOM ARE YOU TESTIFYING?

A. I am an economist, specializing in energy and utility economics, and a principal in Chesapeake Regulatory Consultants, Inc., Columbia, MD. I am testifying in this proceeding on behalf of the Division of the Ratepayer Advocate (Ratepayer Advocate).

Q. PLEASE DESCRIBE YOUR EDUCATION AND PROFESSIONAL EXPERIENCE.

A. I received my education at Portland State College (1967-1969), New Mexico Institute of Mining and Technology (1969), and Oregon State University (1972-75). In 1974 I received a Bachelor of Science degree in Economics from Oregon State University, and in 1976 a Master of Science degree in Resource Economics (with a minor in Business Finance) from the same institution.

From August 1975 to February 1977, I worked as a financial analyst and staff economist for the Arkansas Public Service Commission. From March 1977 to August 1978, I worked in a similar position with the Iowa State Commerce Commission. In September of 1978 I went to work for the Attorney General of Arkansas in a U.S. Department of Energy-funded office of consumer services, with responsibility for economic analysis in electric utility rate cases. While with the Attorney General, I assisted in the development of legislation that created the Arkansas Department of Energy. In July of 1979, soon after the Department was officially created, I became Deputy Director for

Forecasting. In that position, I directed a staff with broad responsibilities which included the development of an energy management information system for monitoring energy supply and demand in Arkansas, including comprehensive forecasts of energy demand by fuel source and sector.

I left the Arkansas Department of Energy in January 1981, and worked briefly as an independent consultant before joining the consulting firm of Hess and Lim, Inc., in April 1981. While employed by Hess and Lim, I served as a consultant on numerous rate cases before the FERC and various state utility commissions. I left Hess & Lim in October 1986 to join with two other consultants in the founding of Chesapeake Regulatory Consultants. I have testified or provided technical assistance in over 150 proceedings before the FERC, the FCC, and regulatory bodies in: Alabama, Arizona, Arkansas, California, Colorado, Georgia, Illinois, Iowa, Kansas, Maine, Maryland, Mississippi, Montana, New Mexico, New York, Oklahoma, Pennsylvania, Rhode Island, South Dakota, Texas, Vermont, Washington State, West Virginia, and the District of Columbia. On four occasions I have been invited to appear on the program of the annual conference of Michigan State University's Institute of Public Utilities, and I have served as faculty for the Michigan State-NARUC summer training program for regulatory commission personnel.

I have published numerous articles on a variety of utility issues, including articles or comments in *Land Economics, American Economic Review, Public Utilities Fortnightly, Journal of Business Research, Yale Journal on Regulation, Journal of Portfolio Management, Energy Law Journal,* and the *Financial Analysts Journal*. My 1982 article in the Financial Analysts Journal on the equity risk premium received a Graham and Dodd award from the Financial Analysts Federation. I have also served as an academic referee for two academic journals where I reviewed articles on utility economics and finance. My article in the Spring 1991 issue of the *Energy Law*

Journal[1] deals with the constitutional standards for due process as applied to utility ratemaking under the celebrated Hope case. It offers a comparative analysis and critique of the 1989 Duquesne decision.[2] A list of publications is provided at the end of my testimony.

II. INTRODUCTION AND SUMMARY OF POSITION

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. My testimony presents evidence concerning the cost of equity capital for Elizabethtown Gas Company ("Elizabethtown" or "Company"), and recommends a fair and reasonable rate of return based upon that evidence. I will also review and respond to Elizabethtown's presentation of evidence concerning the cost of equity capital. In addition, I will comment on the Company's testimony regarding the number of years to be used in computing the weather normalization adjustment.

Q. PLEASE SUMMARIZE YOUR CONCLUSIONS REGARDING THE COST OF EQUITY CAPITAL AND YOUR RECOMMENDED RATE OF RETURN ON EQUITY.

A. Based on the evidence presented in this testimony and accompanying schedules, I conclude that the cost of equity capital for Elizabethtown is in the range of 9.0 to 10.0 percent, with the best evidence supporting a determination of about 9.5 percent. I recommend a rate of return on equity of 9.5 percent. A rate of return on equity of 9.5 percent is fair and reasonable under current market conditions, and is sufficient to maintain the Company's financial integrity.

[1] "Procedural vs. Substantive Economic Due Process for Public Utilities," with Walter Nixon. *Energy Law Journal* 12 No. 1 (Spring 1991): 81-110.

III. OVERALL RATE OF RETURN AND THE COST OF EQUITY

Q. PLEASE EXPLAIN THE RELATIONSHIP BETWEEN THE OVERALL RATE OF RETURN AND THE COST OF EQUITY.

A. Typically, regulated utilities have utilized three sources of capital to capitalize their utility assets: common stock, preferred stock, and long-term debt. The rate of return for a regulated firm is usually based on its "weighted average cost of capital." This weighted average cost of capital represents the cost of the individual sources of capital weighted by their proportion as represented in the capital structure. My determination of Elizabethtown's capital structure and overall rate of return is shown in my Exhibit____(BLC-1), Schedule 1. The cost of equity, and my recommended return on equity of 9.5 percent, is one component of this overall rate of return.

Q. HOW ARE CAPITAL COSTS MEASURED?

A. The cost of long-term debt can be directly measured from the interest rate (and related costs) on the various issues of debt used to support the capital structure, and is only rarely a direct source of significant controversy in establishing a rate of return for a regulated utility. The cost of common equity, however, cannot be directly measured or estimated. It must be inferred from market-based common stock dividend and price information using one or more cost of equity estimation methodologies.

Q. WHY IS IT IMPORTANT TO BASE THE ALLOWED RATE OF RETURN ON EQUITY ON THE MARKET COST OF EQUITY?

[2] *Federal Power Comm'n v. Hope Natural Gas,* 320 U.S. 591 (1944); *Duquesne Light Co. v. Barasch*, 488 U.S. 591 (1989).

A. Basing the allowed rate of return on equity on the market cost of equity accomplishes two significant and desirable regulatory objectives. First, it fairly balances the competing interests of ratepayers and shareholders. Ratepayers are interested in receiving safe and reliable service at the lowest possible cost. Shareholders are interested in receiving the highest rate of return they can. A rate of return based on the market cost of equity fairly and reasonably balances these competing interests. If the allowed rate of return on equity is significantly below the market cost of equity, the impairment of the firm's financial integrity undermines its ability as an ongoing concern to render safe and reliable service. So it is in the ratepayer's interest to allow a rate of return on equity at least equal to the market cost of equity. Ratepayers, however, have no interest in paying a rate of return significantly above the cost of equity. And while shareholders may delight at the opportunity to earn the excess profits associated with a return on equity above the cost of equity, they should not complain if the allowed equity return is consistently established on the basis of the market cost of equity. Such a return is commensurate with the financial risks they incur, and with the returns they could earn elsewhere in the marketplace on comparable investments.

Second, an allowed rate of return on equity for the Company equal to the firm's market cost of equity provides the appropriate management incentives to operate the firm safely, reliably and efficiently. An allowed rate of return on equity equal to the firm's market cost of equity provides the same kind of incentive or goal to the managers of a regulated firm as do earnings per share and market value goals for a competitive unregulated firm. If the return on equity is less than the cost of equity, management will be tempted to cut corners to achieve an adequate return for its shareholders. If the return on equity is greater than the cost of equity, then management may lack the incentive to be as efficient as possible. By giving management has a reasonable opportunity to earn a rate of

return on equity equal to the market cost of equity, it should be able to meet all reasonable goals and expectations of both shareholders and ratepayers.

Q. WHAT METHODS DID YOU USE TO DETERMINE THE COMPANY'S COST OF EQUITY CAPITAL?

A. I used two variations of the "Discounted Cash Flow" ("DCF") methodology. I also performed a supplemental "Capital Asset Pricing Model" ("CAPM") analysis.

Q. DID YOU PERFORM ANY OTHER ANALYSIS TO ASSURE THAT YOUR RECOMMENDED RATE OF RETURN WILL MAINTAIN ELIZABETHTOWN'S FINANCIAL INTEGRITY?

A. Yes. I calculated the interest coverage ratio my rate of return recommendation will provide. Using Elizabethtown's gross revenue conversion factor, I estimate that my rate of return recommendation will provide pro-forma pre-tax earnings equal to 4.26 times Elizabethtown's interest requirements. This is more than adequate to maintain the Company's financial integrity.

IV. ELIZABETHTOWN'S COST OF EQUITY CAPITAL

Q. PLEASE EXPLAIN THE BASIC PROCEDURES INVOLVED IN USING THE "DISCOUNTED CASH FLOW" METHODOLOGY.

A. In its most basic form, the DCF theory is a "constant growth" model in which the investor's required return on common stock equity equals the dividend yield on the stock plus the expected rate of growth in the dividend. This relationship is commonly represented mathematically as:

$$k = D/P + g$$

where k is the cost of equity capital (the investor's required return), D/P is the dividend yield (the dividend divided by market price), and g is the expected rate of growth in the dividend. Depending on the nature of the assumptions and mathematical procedures employed in the derivation of the model, the dividend yield portion of the total return is variously represented as D_0/P_0 or D_1/P_0 where D_0 and D_1 represent the "current dividend" and the "next period dividend," respectively. Depending further on what is assumed about the frequency of the dividend payout and the compounding of intra-period retained earnings, as an annual yield D_0/P_0 will tend to understate the effective yield, while D_1/P_0 will tend to overstate it. A valid argument can be made for using an average of the two, sometimes presented in the form $D_0(1+.5g)/P_0$.[3] This is the form of the constant growth model I used in my initial DCF analysis.

Q. WHAT OTHER STEPS ARE INVOLVED IN IMPLEMENTING THE DCF METHODOLOGY?

A. The principal steps in implementing the DCF approach are the selection of a sample of companies to which to apply the method, and the selection of measures of expected growth. Where possible, I prefer to utilize the same sample of companies that the applicant uses to determine its cost of capital. In this instance, I used the same sample of companies used by the Company's witness, with one exception.

Q. WHAT WAS THAT EXCEPTION?

A. I excluded Southern Union. Southern Union pays no dividend, and the cost of equity for companies which pay no dividend cannot be accurately estimated using the discounted cash flow model (because the discounted cash flow model is based on investor evaluations of cash flow from *dividends*).

Q. WHAT DATA DID YOU EXAMINE IN ORDER TO ESTIMATE THE INVESTOR EXPECTED GROWTH RATE FOR YOUR DCF ANALYSIS?

A. For my constant growth DCF study, I utilized the Zacks consensus estimate of projected growth in earnings per share ("EPS"), and Value Line estimates of growth in dividends per share ("DPS"), growth in book value per share ("BVPS"), and the Value Line estimate of "% Retained to Common Equity" (a measure of long term sustainable growth).[4] Theoretically, if the constant growth assumptions are valid, earnings, dividends, and book value per share

[3] Conceptually, D (dividends per share) represents an economic "flow", while P (price per share) represents the market valuation of an economic "stock" of assets. Correctly relating the flow of dividends to the stock of assets that generates the flow requires using the average of D_0 and D_1.

[4] Zacks and Value Line are sources of financial data widely used by investors. Besides basic financial data, Zacks surveys institutional investors to collect data on expected earnings growth (referred to as "consensus" estimates of expected earnings growth). "% Retained to Common Equity" is a measure of the ratio of retained earnings to common equity, or the "plowback ratio." It is equivalent to the "br" measure of expected dividend growth used in some presentations of the DCF model.

should all grow at approximately the same rate. Where this is the case, it is sometimes possible to derive reasonable and accurate estimates of the cost of equity using only one of these growth measures as a "proxy" for the expected rate of growth in dividends. But if the payout ratio is not constant, using just projected earnings or dividend growth can result in distorted estimates of the DCF cost of equity.

Q. WHAT ARE YOUR ESTIMATES OF THE PROJECTED GROWTH RATES FOR THESE MEASURES?

A. The projected growth rates used in my constant growth DCF study are shown on Exhibit____(BLC-1), Schedule 2. As can be seen from Columns F and G, there is considerable disparity between the EPS growth rates projected by Zacks and the DPS growth rates projected by Value Line. The projected EPS growth rates are on average substantially higher than the DPS growth rates. This disparity reflects a projected near-term decline in dividend payout, resulting in a rise in the earnings retention rate. But the constant growth DCF model is a model of investors' long-term dividend growth expectations. Consequently, based on current projections, relying solely upon projected EPS growth rates will overstate the investor's long-term growth expectations. Similarly, relying solely upon projected DPS growth rates will understate the investor's long-term growth expectations.

Q. UNDER THESE CONDITIONS, WHAT IS THE BEST WAY TO ESTIMATE THE CONSTANT GROWTH DCF COST OF EQUITY?

A. Under these conditions, the best way to estimate the constant growth DCF cost of equity is to rely upon an average of the EPS, DPS, and book value per share (BVPS) projections. Short-run or near-term changes in payout ratio do not impact book value per share growth as significantly as they

do EPS and DPS growth, and over time EPS and DPS growth rates will always revert to the rate of growth in book value per share.[5] For this reason, an average of these various growth rate measures is required to reasonably estimate investors' long-term growth expectations.

Q. PLEASE DESCRIBE THE RESULTS OF YOUR CONSTANT GROWTH DCF STUDY.

A. The results are shown on Exhibit____(BLC-1), Schedule 2, Columns L. Column L is the sum of Column E and the average of Columns F, G, H and I. By averaging the growth rates in Columns F, G, H and I, we avoid the bias that arises from relying solely upon a single measure of expected growth. The mean estimate of "k" is 9.99 percent, and the median estimate of "k" is 9.68 percent. The difference between the median and the mean reflects the impact of "outliers" or atypical observations in the calculation of the mean. For that reason the median is the more reliable measure of central tendency. The Company's rate of return witness does something similar in computing what he refers to as a "truncated average," Morin Direct Testimony, page 36, lines 6-8.

Q. DID YOU UNDERTAKE ANY ADDITIONAL DCF ANALYSIS?

A. Yes, I did. In addition to the more traditional form of the DCF methodology, I developed DCF estimates using a "dividend discount model" (DDM). Dividend discount models are more general forms of the DCF methodology which embody less restrictive assumptions than the traditional methodology. The traditional methodology is sometimes referred to as the "constant growth model," and assumes that dividends, earnings, book value per share, and share price all grow at the same uniform rate of growth in perpetuity. While this is rarely the case in actuality, it is not an unreasonable

[5] A trend in the payout ratio faces two limits – a payout ratio of 100 percent if the payout ratio is rising, and a payout ratio of zero if the payout ratio is declining. At these limits growth in dividends or earnings becomes equal to the rate of growth in book value per share. If the trend in payout ratio levels off, so that payout ratio stabilizes, growth in dividends and earnings will equal growth in book value per share. So regardless of the trend in payout ratio, growth in dividends and earnings will always, ultimately, revert to growth in book value per share.

assumption if the differences are small, a condition which implicitly requires a relatively constant dividend payout ratio. Where dividend payout ratios are expected to trend upward or downward over extended periods of time, use of five-year growth projections of the type published by Zacks, Value Line, or other investment services in a constant growth form of the DCF model can produce distorted and unreliable results. Later in my testimony, where I critique the Company's rate of return presentation, I show this to be the case with current investor expectations. Multiple-period dividend discount models provide more reliable and accurate measures of the expected DCF return under such conditions.

Q. PLEASE EXPLAIN IN FURTHER DETAIL HOW THE MULTIPLE PERIOD DIVIDEND DISCOUNT MODEL IS DERIVED.

A. Constant-growth models employ an "infinite horizon." That is, dividends are expected to grow at a fixed rate forever. Multiple period dividend discount models are based on "finite horizon" DCF models where dividends grow at one rate for a fixed, or finite, period of time, and then subsequently grow at some other fixed rate forever.[6] This allows for a more realistic modeling of how investors often value common stock. A multiple period dividend discount model typically takes the form:

$$P_0 = \frac{D_1}{(1+k)^1} + \frac{D_2}{(1+k)^2} + \ldots + \frac{D_t}{(1+k)^t} + \frac{P_t}{(1+k)^t}$$

where

$$P_t = \frac{D_t(1+g)}{(k-g)}$$

Here t is a finite time period at the end of which the stock would be sold for P_t. By postponing the period of constant growth to some finite point of time in the future, dividends can be projected during

[6] For this reason they are sometimes called "two-stage" DCF models. The first stage is a period of finite growth, and the second stage is a period of infinite growth as in the traditional constant growth model.

the interim that follow any pattern consistent with expected earnings growth and dividend payout ratios.

Q. ARE SUCH DDM MODELS ACTUALLY USED BY INVESTORS TO ESTIMATE EXPECTED RETURNS?

A. Yes. Firms such as Prudential-Bache and Merrill Lynch use such models to develop expected returns, which are then used by their investment analysts in making stock buy-hold-sell recommendations. Standard textbooks also present them along with constant growth models. William F. Sharpe, *Investments,* 3d ed. 1985, pp.428-435; Edwin J. Elton and Martin J. Gruber, *Modern Portfolio Theory and Investment Analysis,* 3d ed. 1987, pp. 407-416.

Q. PLEASE DESCRIBE IN FURTHER DETAIL YOUR IMPLEMENTATION OF THIS METHODOLOGY.

A. The basic data employed in my implementation of this methodology is presented in Exhibit____(BLC-1), Schedule 3. This is a summary sheet with input data and the resulting DDM estimates of the cost of equity. Detailed backup is provided in my workpapers.

The basic input data consists of the current dividend yield, an estimated EPS projection for 2002, the current Zacks consensus EPS growth projection, an estimate of long-term growth into perpetuity, and estimated retention ratios for 2002, 2006, and 2021. The DDM analysis assumes that earnings grow from 2002 to 2006 at the indicated Zacks consensus EPS growth rate, and at the long-term growth rate (5.75 percent, the median value of Value Line's "% Retained to Common Equity") thereafter. The period from 2006 to 2021 is a transition period during which the payout ratio changes from the value projected by Value Line in the year 2006 to a common value of 0.48 (the median Value Line estimate for 2006) for all companies in the sample in the year 2021.

Constant growth assumptions — long-term growth 5.75 percent, and a retention ratio of 0.48 percent — apply after the year 2021, allowing the determination of a terminal share price for the year 2021. These long-term conditions after 2021 are applied to all the companies in the sample. Having generated a series of cash flows, the model generates an expected return, *k*, by solving the following equation:

$$0 = \frac{D_1}{(1+k)^1} + \frac{D_2}{(1+k)^2} + ... + \frac{D_t}{(1+k)^t} + \frac{P_t}{(1+k)^t} - P_0$$

The solution to this equation is the value of *k* which makes the right hand side of the equation zero. In effect, what this process does is find the value of *k* that equates the present value of the cash flows to the current stock price. This can only be done by trial and error. However, there are generally available computer algorithms for finding the solution to such formulas automatically. The DDM returns shown on Exhibit____(BLC-1), Schedule 3, were developed using the Microsoft Excel "solver" routine in an Excel spreadsheet.

Q. PLEASE SUMMARIZE THE RESULTS AND COMMENT ON THEIR SIGNIFICANCE.

A. The mean DDM return for the sample was 9.36 percent, and the median DDM return was 9.46 percent. These results are slightly lower than the constant growth DCF returns presented in Exhibit____(BLC-1), Schedule 2, and suggest that the constant growth DCF returns may slightly overstate the weight or effect of near-term earnings growth.

Q. DID YOU UNDERTAKE A SUPPLEMENTAL ANALYSIS OF THE COST OF EQUITY FOR THE SAMPLE OF COMPARABLE COMPANIES TO VALIDATE YOUR DCF RESULTS?

A. Yes, I did. I used the "Capital Asset Pricing Model" (CAPM) to develop a third estimate of the cost of equity. CAPM is a risk premium methodology based on the principle that the cost of equity capital equals the cost of a risk-free investment, plus a "risk premium" to compensate investors for the risks associated with a specific equity investment. Under the CAPM methodology, the overall market risk premium for common stock is adjusted to reflect the risk of a specific stock or sample of stocks using the stock's "beta coefficient." A beta coefficient is a financial market measure used in developing a risk-adjusted risk premium that reflects the market risk of an individual stock (sometimes referred to as its "systematic risk") relative to the risk of the market as a whole. This stock-specific risk premium is then added to an appropriate "risk-free" rate to yield a total required rate of return. Mathematically, the CAPM methodology can be stated as:

$$k = r_f + \beta r_p$$

where r_f is the risk-free rate, β is the stock's beta coefficient, and r_p is the market risk premium. For an estimate of the required return on stock, the yield on long-term government bonds is conventionally used to estimate the risk-free rate. More problematic is the estimate of the market risk premium.

Q. HOW DID YOU ESTIMATE THE OVERALL MARKET RISK PREMIUM AND BETA COEFFICIENT?

A. I estimated the overall market risk premium using the historical return data shown on Exhibit____(BLC-1), Schedule 4. These data indicate that for the last 75 years, common stocks have earned a premium over long term U.S. Treasury bonds of about 5.85 percent, annually. For the "beta coefficient," I utilized the Value Line estimates for the sample of combination utilities that I used to develop my DCF estimates.

Q. WHAT IS THE RESULTING CAPM ESTIMATE OF THE COST OF EQUITY?

A. The median "beta coefficient" (as computed by Value Line) for the sample of comparable combination utilities is 0.60. Using a 5.85 percent market risk premium, and a recent long-term (30-year) U.S. Treasury bond yield of 5.5 percent (a 180-day moving average, as of July 29, 2002), the resulting CAPM estimate of the cost of equity is:

$$k = 5.50 + (0.60 \times 5.85) = 5.50 + 3.51 = 9.01 \text{ percent.}$$

This result corroborates the reasonableness of my DCF estimates, and provides additional evidence of a reasonable range for the Company's cost of equity.

Q. CONSIDERING THE EVIDENCE YOU PRESENT, WHAT IS YOUR ESTIMATE OF THE COST OF EQUITY FOR ELIZABETHTOWN GAS?

A. Based upon the evidence presented above, I conclude that the cost of equity for Elizabethtown Gas is presently in the range of 9.0 to 10.0 percent. The best evidence supports a return of about 9.5 percent. This is not only the midpoint of the range, but is strongly supported by the DCF DDM results. The DDM approach is presently superior to the more traditional constant growth approach because investors are not currently expecting constant growth. For these reasons I recommend a return on equity of 9.5 percent.

V. ANALYSIS OF ELIZABETHTOWN RATE OF RETURN TESTIMONY

Q. HAVE YOU REVIEWED THE TESTIMONY AND EXHIBITS OF ROGER A. MORIN, THE WITNESS SPONSORING ELIZABETHTOWN'S REQUESTED RETURN ON EQUITY?

A. Yes, I have. Dr. Morin utilizes a combination of DCF and CAPM or risk premium methodologies. His implementation of these methodologies substantially overstates the actual cost of equity and required rate of return on equity for Elizabethtown Gas.

Q. PLEASE EXPLAIN HOW DR. MORIN'S DCF STUDIES OVERSTATE THE ACTUAL COST OF EQUITY FOR ELIZABETHTOWN GAS.

A. Dr. Morin has used a simple constant growth version of the DCF model for his DCF analyses. For his growth rate, he references and utilizes two sources of *earnings* growth rate projections, and completely ignores dividend and book value per share growth projections. Using earnings growth projections in a *constant growth* DCF model, to the exclusion of other growth measures, is appropriate and correct only if payout ratios are relatively stable and earnings, dividends, and book value per share all grow at roughly the same rate of growth. Dr. Morin acknowledges these well-known principles and requirements in his testimony at page 32, line 18, through page 33, line 1. The essential underlying theoretical conditions for the constant growth DCF model are violated by Dr. Morin's DCF studies, undermining the theoretical consistency and empirical validity of Dr. Morin's DCF estimates. The effect is to overstate the actual cost of common equity for Elizabethtown Gas.

Q. DO YOU HAVE EVIDENCE TO SUPPORT WHAT YOU ARE SAYING ABOUT DR. MORIN'S DCF STUDIES?

A. Yes, I do. The data in my Exhibit____(BLC-1), Schedule 2, show that earnings are currently projected to grow at rates substantially above dividend growth rates, implying a near term decline in payout ratio and rise in the earnings retention rate. This shows that the constant growth requirements are not met by the data relied upon by Dr. Morin. With a rise in the earnings retention rate, a constant growth DCF analysis that utilizes only earnings projections such as that employed by Dr. Morin will overstate the actual expected DCF return.

Q. IS THIS A DEFICIENCY IN THE USE OF ANALYSTS' EARNINGS FORECASTS PER SE?

A. No, it is not. In my Exhibit____(BLC-1), Schedule 3, I utilize one of the same sources – Zacks – as utilized by Dr. Morin on his Exhibit RAM-3, Page 2. But I utilize it not in the inappropriate context of a constant growth DCF model, but in the context of a more theoretically appropriate DDM, or non-constant growth, model. The DDM approach yields a DCF estimate of about 9.5 percent. Again, the difference between this result, and the higher result obtained by Dr. Morin, is attributable to his inappropriate use of earnings projections only in a constant growth DCF model at a time when the constant growth requirements are not satisfied by actual market conditions.

Q. PLEASE EXPLAIN WHY DR. MORIN'S CAPM ANALYSIS OVERSTATES THE MARKET COST OF EQUITY.

A. Dr. Morin utilizes two different approaches to estimate the market risk premium for his CAPM analysis. The first is an estimate of the market risk premium of 7.3 percent based on the Ibbotson Associates analysis of stock market returns vs. long-term bond rates. In deriving this figure,

Ibbotson Associates takes the simple annual *arithmetic* mean of the return difference between common stock and long-term bond yields. This is not the correct procedure for determining a "long horizon" equity risk premium. The correct approach will be based on a *geometric* mean for an appropriate or reasonable "long horizon" risk premium. While Ibbotson Associates have tried to defend their approach in their annual "Yearbooks", their defense is internally inconsistent and actually proves that the geometric mean is the appropriate measure for determining a long horizon risk premium! Rather than get sidetracked here with further details on the flaws in their efforts to defend the arithmetic mean, I have relegated the details to a "Technical Appendix" at the end of my testimony. The correct procedure for computing a long horizon equity risk premium is presented in an article by Russell J. Fuller and Kent A. Hickman. *See* Russell J. Fuller and Kent A. Hickman, "A Note on Estimating the Historical Risk Premium," *Financial Practice and Education,* Fall/Winter 1991, Vol. 1, No. 2, 45-48. They show that the risk premium should be calculated from the geometric mean for periods matching the investment horizon for which the risk premium is being computed. For a "long horizon" investment like common stock, I typically use a time period of about 15 years, as reflected in my Schedules 4 and 5. I used the procedure described by Fuller and Hickman in constructing my Exhibit____(BLC-1), Schedule 4. The important thing to underscore here is that my Schedule 4, which shows an average long horizon risk premium of 5.85 percent, is based on the same underlying data as Dr. Morin's 7.3 percent. The difference is not in the data, it is the methodology applied to the data. Ibbotson Associates – whom Dr. Morin merely follows – incorrectly rely on the arithmetic mean in their analysis of the data. I have relied on the correct geometric mean.

Dr. Morin's second method of estimating the market risk premium is "a DCF analysis applied to the aggregate equity market" [Morin Direct, Page 23, Lines 19-20]. This appears to be based on a simple "constant growth" DCF model, and would be subject to the problems I described earlier with using the constant growth DCF model. Unless this result can be confirmed or corroborated with a non-constant or DDM analysis, it is unreliable and should not be relied upon by Your Honor and the Board in determining the Company's cost of equity.

Q. IS THERE ANY OTHER SIGNIFICANT DEFICIENCY IN DR. MORIN'S CAPM ANALYSES?

A. Yes, there is. Dr. Morin presents two forms of the CAPM approach: a traditional CAPM approach, and an empirical approximation to the CAPM (which he designates "ECAPM"). In the empirical form, the risk premium is a weighted average with 75 percent weight assigned to beta times the market risk premium, and 25 percent weight assigned to the market risk premium per se. As described by Dr. Morin, this has the result of "flattening" the risk return relationship, bringing the results more in line with empirical findings. The effect of this "flattening" of the risk return relationship is to raise the estimated cost of equity for companies with betas below 1.0, and lower the estimated cost of equity for companies with betas above 1.0. Since natural gas distribution companies tend to have betas below 1.0, this empirical form of the CAPM raises their estimated cost of equity.

The problem with the empirical CAPM, as implemented by Dr. Morin, is that he is using the wrong kind of data. Empirical studies resulting in a "flatter" risk-return relationship than predicted by CAPM employ "raw" or "unadjusted" betas. Dr. Morin has not utilized such "raw" or "unadjusted" betas. He has utilized published Value Line betas, which are *already* adjusted by weighting the actual beta with the overall market beta of 1.0. According to Dr. Morin, in his response

to Data Request RAR-ROR-4, Value Line assigns a weight of two-thirds (0.67) to the actual beta, and one-third (0.33) to the overall market beta of 1.0. In his empirical CAPM, Dr. Morin assigns a weight of three-fourths (0.75) to the actual beta, and one-fourth (0.25) to the overall market beta.

Value Line has thus *already* adjusted the beta such that the use of a Value Line beta in a CAPM equation more than adequately compensates for the empirical evidence relied upon by Dr. Morin. Any further adjustment is gratuitous and unnecessary. This adjustment that Value Line makes their betas has the same effect as Dr. Morin's empirical CAPM adjustment: it flattens the risk-return relationship, thereby raising the estimated cost of equity for firms with betas below 1.0, and lowering the estimated cost of equity for firms with betas above 1.0. By utilizing the Value Line adjusted betas in his empirical CAPM, Dr. Morin has obtained a flatter risk-return relationship than is justified by the empirical studies he relies upon for his empirical CAPM. In effect, he has double-counted the empirical evidence for a flatter risk-return relationship.

Q. DO YOU HAVE ANY COMMENTS REGARDING DR. MORIN'S SCHEDULE RAM-2, PAGE 1 OF 1?

A. Yes, I do. This exhibit presents a risk premium analysis comparing the returns on natural gas distribution stocks to the yield on long-term government bonds. Methodologically, it is identical to the Ibbotson Associates approach, but uses natural gas distribution stocks as the basis for the equity return rather than an index for the market as a whole. As such, it incorrectly bases the long horizon risk premium on a simple annual arithmetic average. I have taken the data in Dr. Morin's exhibit and calculated geometric mean holding period returns for 15 year holding periods comparable to the approach utilized in my Exhibit____(BLC-1), Schedule 4. The results are shown in Exhibit____(BLC-1), Schedule 5. I estimate the average long horizon risk premium for natural gas

distribution stocks to be 4.7 percent, much lower than the 6.1 percent computed by Dr. Morin. When this lower result is substituted for Dr. Morin's in the calculation shown on Page 28 of his testimony, the implied cost of equity is only 10.5 percent (5.8% + 4.7%). Using a more recent bond yield of 5.5 percent would imply a cost of equity of only 10.1 percent (5.5% + 4.7%), bringing the result down near the top end of my other rate of return estimates.

Q. DR. MORIN ALSO PRESENTS EVIDENCE BASED ON AN EXAMINATION OF HISTORICAL RISK PREMIUMS IMPLIED BY ALLOWED RATES OF RETURN FOR NATURAL GAS COMPANIES. DO YOU HAVE ANY COMMENTS ON THIS EVIDENCE?

A. Yes, I do. There are both conceptual and empirical problems with Dr. Morin's testimony on this approach. Conceptually, the approach assumes that all natural gas distribution companies, at every point in time, are comparable in risk, and have a constant and comparable risk premium. It also assumes that commissions never take into consideration anything other than cost of equity in determining the allowed rate of return. Neither of these assumptions is even remotely plausible. With respect to the first, we have something like an "assumes facts not in evidence" problem. Do the companies have comparable capital structures? Are they all principally distribution companies, or do the data include allowed rates of return for gas transmission companies, or companies with substantial unregulated assets? Some commissions update the rate of return evidence with reference to changes in capital market conditions since the close of record, while others do not. This introduces another element of uncertainty with respect to the degree of comparability among jurisdictions.

With respect to the second assumption, allowed rates of return on equity are not always determined solely by cost of equity considerations. Some of the allowed rates of return may be the result of commission approval of negotiated settlements in which parties arguing for a lower rate of return on equity accepted a higher rate of return in return for concessions on other issues. Or the allowed rate of return may be higher than the determined cost of equity as part of an incentive program, or as an implicit allowance for regulatory lag. For a variety of reasons, the published allowed rate of return on equity may not actually equal what the commission or board in question determined to be the actual cost of equity.

Another conceptual issue with this approach is that it is like a "self-fulfilling prophecy." If applied consistently, it simply perpetuates past rates of return allowances, and requires no new or independent evidence of the cost of equity. Implicitly it is as if Commission A allows "x" as a fair rate of return because it is what Commission B allows, and Commission B allows "x" because it is what Commission C allows, while Commission C allows "x" because it is what Commission A allows. It is inherently circular in reasoning, and does away with the need for any independent commission determination of what is fair and reasonable.

Q. PLEASE DESCRIBE THE EMPIRICAL PROBLEMS WITH THIS APPROACH.

A. Empirically, Dr. Morin is attempting to calculate the average risk premium associated with allowed returns on equity by comparing allowed rates of return on equity with long-term treasury yields over time. But the empirical evidence presented by Dr. Morin in support of this approach is fundamentally flawed and unreliable. On page 30 of his direct testimony, Dr. Morin presents a simple linear regression equation to support his risk premium calculation. Reliable linear regression involves certain well-known assumptions. One of these well-known assumptions is that the error term (the

difference between the "actual" value and the "fitted" value) be randomly distributed. All one has to do to see that this assumption is violated by Dr. Morin's regression equation is look at the graph at the bottom of page 30 of his testimony. The assumption of random distribution of the error term requires that the actual observations be randomly distributed about the fitted line. That is clearly not the case. At the ends of the fitted line, the actual values are all above the line, while in the middle of the line the actual values are all below the fitted line. It seems to me that it should have been obvious to Dr. Morin that the data do not support a simple linear regression. The true relationship is non-linear.

Coming at this same problem from a different perspective, on the preceding page of Dr. Morin's testimony, page 29, there is a time plot (graph) showing allowed risk premiums plotted against time. For the underlying data to fit the assumptions required for valid linear regression, the allowed risk premiums would have to be randomly distributed about the flat line in the graph representing "Avg. Risk Premium." Again, this is clearly not the case. The points are below the line in the early years of the time plot, and above the line in the later years of the time plot. While Dr. Morin tries to explain this in terms of rising competition and restructuring in the industry, all it really shows is that there is an inverse relationship between allowed risk premiums and interest rates. As interest rates rise, allowed risk premiums shrink, and vice versa. Much of this owes simply to regulatory lag. That is, regulatory decisions setting allowed rates of return typically lag actual market changes in the cost of capital. For instance, when interest rates rise, allowed rates of return may rise, but more slowly because of the time it takes for commissions to act on requested rate increases. And the lag is even greater in the opposite direction: companies tend *not* to file for decreases in the allowed rate of return when capital costs decline, so there is often a very long lag between the time

capital costs decline and rate of return allowances decline. But regardless of the cause, this inverse relationship undermines the statistical validity of Dr. Morin's regression equation. Since the regression equation violates the basic assumptions of linear regression, Your Honor and the Board should give it no weight in reaching a determination about the cost of equity or fair rate of return for Elizabethtown Gas Company.

Q. DR. MORIN TESTIFIES REGARDING THE NEED FOR A FLOTATION COST ALLOWANCE. DO YOU AGREE WITH HIS TESTIMONY?

A. No, I do not. An allowance for flotation costs is often a purely hypothetical exercise unrelated to setting a rate of return on equity that reasonably balances the competing interests of investors and ratepayers. That is clearly the case here. I have examined cash flow statements and supporting discussions and footnotes regarding liquidity and capital resources in NUI's most recent Annual Report to Shareholders, and its last two SEC Form 10-K's. The parent company of Elizabethtown has not publicly issued common stock in recent years, nor has it any specific plans to do so in the reasonable future. I also have a problem with some of the language used by Dr. Morin to justify his adjustment. He says, for example, "the flotation cost adjustment is permanently required to avoid confiscation even if no further stock issuances are contemplated." [Morin Appendix A, Page 2 of 8.] "Confiscation" is a legal concept and I do not know if Dr. Morin appreciates the subtleties and complexities of the subject. In my opinion we should concern ourselves only with the financial and economic issues under consideration. Turning to that consideration, I would certainly disagree that a flotation cost adjustment is justified "even if no further stock issuances are contemplated." The market cost of capital is a *forward-looking* concept. Past flotation costs are classic "sunk costs" and will not be taken into consideration by rational, forward-looking, investors. Complicating

matters, even on a forward looking basis it is difficult to determine the appropriate level of such an adjustment because it requires an estimate of the proportion of common stock that comes from new sales over a very long period of time. Despite what Dr. Morin argues in his Appendix A, if a company can fully finance its ongoing, forward looking, equity capital requirements through retained earnings, it will incur no future flotation costs, and a flotation cost adjustment will merely accrue to the equity owners in the form of a higher earned return on equity. In other words, it simply becomes a source of revenue for which there is no corresponding cost.

Q. DO YOU BELIEVE THAT TO BE THE CASE HERE?

A. Yes, I do. Dr. Morin proposes an allowance of 0.3% return on equity for flotation costs. Multiplying this times the $222,541,000 of equity in Elizabethtown's capital structure results in an annual equity return requirement of $667,000. On Dr. Morin's theory, this represents 5 percent of the total equity capital putatively raised *every year* through public stock offerings, or approximately $13.4 million (e.g. $667,000 divided by 0.05). There is no evidence in the financial documents I reviewed that NUI, on behalf of Elizabethtown, has any plans to publicly issue *any* common stock in the foreseeable future, let alone $13.4 million *a year*. And without that level of market activity, Dr. Morin's proposed flotation cost adjustment flows directly to earned income. And because it is an element of income and is not a true cost of service item, the rate impact is greater by about 70 percent when multiplied by the gross revenue conversion factor. In other words, this 0.3% percent adjustment requires annual revenues of about $1.1 million. I am quite sure that Elizabethtown would consider a cost of service adjustment reducing its revenues by $1.1 million to be significant. But in effect it is proposing a $1.1 million *increase* in its revenue requirement for a cost which is hypothetical at best, and on the best evidence presently non-existent.

VI. WEATHER NORMALIZATION ADJUSTMENT

Q. WHAT IS THE NATURE OF YOUR TESTIMONY REGARDING THE WEATHER NORMALIZATION ADJUSTMENT?

A. My colleague, David Peterson, has asked me to look at the statistical evidence for whether the average level of heating degree days (HDD) should be based on a 30-year average, or a 10-year average. I've examined the data and I've concluded that it should be based on a 30-year average.

Q. HOW DID YOU ARRIVE AT THIS CONCLUSION?

A. I utilized the same kind of statistical reasoning, and evidence, as that used by Dr. Morin in justifying the use of 74 years in computing the historical average market risk premium. On page 25 of his testimony, he states:

> Since … there is no significant serial correlation in the aforementioned Ibbotson study of historical market risk premiums, it is reasonable to assume that these quantities will remain stable in the future. [Direct Testimony, page 25, lines 8-14.]

Serial correlation is a statistical measure of the degree of randomness in a time series of data. A serial correlation near zero indicates the absence of any discernable pattern in the data. Where that is the case, the best estimate of its expected value is the average of its past values, and there is no justification to rely solely on the most recent values of the data series. I tested for serial correlation in the 53 years of HDD data presented in the testimony of Dr. David A. Robinson by correlating the annual change in HDD (*e.g.*, the "first differences") against time. Examining the resulting residuals, I found no evidence of significant serial correlation in the annual HDD data, indicating that it is reasonable to assume that a 30 year average will give a better indication of average HDD in the

future than a shorter 10 year average. Exhibit____(BLC-1), Schedule 6, presents the statistical results of my analysis. While the residual plot shows some increase in the volatility in HDD in recent years, it shows no evidence of an actual trend over the period of time examined.

Q. DOES THAT COMPLETE YOUR TESTIMONY AT THE PRESENT TIME?

A. Yes, it does, except for the Technical Appendix and List of Publications which follow.

TECHNICAL APPENDIX

On Geometric vs. Arithmetic Means in the Analysis of Investor Returns

Q. WHAT IS THE PURPOSE OF THIS TECHNICAL APPENDIX?

A. The purpose of this technical appendix is to discuss the use of geometric vs. arithmetic means in the analysis of investor returns. The Ibbotson Associates Annual SBBI Yearbook is often cited by rate of return witnesses as authority for using arithmetic returns rather than geometric returns in determining the historical risk premium. According to Ibbotson Associates

> The expected equity risk premium should always be calculated using the arithmetic mean. The arithmetic mean is the rate of return which, when compounded over multiple periods gives the mean of the probability distribution of ending wealth values. (A simple example given below shows that this is true.)[7]

The portion of the preceding quote that is underscored is underscored for emphasis, because it is in fact correct. The relevant measure of investor expectations — whether of the total return, or of a component of the return such as a risk premium — is the rate of return which, when compounded over multiple periods, produces the expected ending wealth value. This much is not in dispute. What is in dispute is how this arithmetic mean expected return is to be calculated empirically from historical return data. It is at this point that the discussion of geometric mean vs. arithmetic mean in the Ibbotson SBBI Yearbook becomes confused, and wrong.

I will demonstrate the confusion in the Ibbotson SBBI Yearbook by reference to two simple examples, both taken from the Yearbook. At one place in the Yearbook, Ibbotson Associates describes the difference between the geometric and arithmetic mean in the following way:

> A simple example illustrates the difference between geometric and arithmetic means. Suppose $1.00 was invested in a large company stock portfolio that experiences successive annual returns of +50 percent and -50 percent. At the end of the first year, the portfolio is worth $1.50. At the end of the second year, the portfolio is worth $0.75. The annual arithmetic mean is 0.0 percent, whereas the annual geometric mean is -13.4 percent. Both are calculated as follows:
>
> $\mathbf{r_a} = 1/2(0.50 - 0.50) = 0.0$, and
>
> $\mathbf{r_g} = (0.75/1.00)^{1/2} - 1 = -0.134$.
>
> The geometric mean is backward-looking, measuring the change in wealth over more than one period. On the other hand, the arithmetic mean better

[7] Ibbotson Associates, SBBI 1997 Yearbook, 154. The same or similar language has appeared in the Yearbook for a number of years.

> represents a typical performance over single periods and serves as the correct rate for forecasting, discounting, and estimating the cost of capital.[8]

The underscored rationale for using the arithmetic mean rather than the geometric mean to determine the average rate of return on the portfolio is irrelevant and ad hoc. No investor with a portfolio originally worth a dollar, and only worth $0.75 two years latter, would conclude that his or her average return over those two years was zero.

Moreover, to claim that this is so is fundamentally inconsistent with the underlying proposition which Ibbotson Associates is affirming — that "the arithmetic mean is the rate of return which, when compounded over multiple periods gives the mean of the probability distribution of ending wealth values." Let's put this in the form of a simple test question for a hypothetical exam in "Finance 101."

> Assume a portfolio is originally worth $1.00, and two years later is worth $0.75. What is the arithmetic return which, when compounded, gives the ending wealth value of $0.75?

The answer, contra Ibbotson Associates, is not zero. The arithmetic return, which, when compounded, gives the ending wealth relative is the geometric mean of the relative change in wealth values,. i.e., -0.134. An arithmetic mean return of -0.134, when compounded for two years, will cause a decline in the relative value of the portfolio from its original value of $1.00 to $0.75:

$$\$1.00(1 + (-0.134))(1 + (-0.134)) = \$0.75$$

I.e., the geometric mean is the arithmetic mean which, when compounded, gives the ending wealth value.

The expression "when compounded" in the preceding paragraph was underscored for a reason. When an arithmetic return is compounded over multiple periods of time, the only way to determine the average uncompounded arithmetic return reflected in the series of wealth values is to calculate the geometric mean of the beginning and ending wealth values. The geometric mean takes out the effect of compounding, and gives us the "uncompounded arithmetic mean." And this is what we want in developing investor returns or risk premia from historical data. "A simple example below shows that this is true."

Consider the "simple example" which Ibbotson Associates offers in support of using the arithmetic mean to calculate the risk premium. In the example, contained on pages 154-155 of the 1997

[8] Id., 104.

Yearbook, a simple probability distribution is created which yields an expected ending value of $1.21 for an original investment of $1.00. They then conclude:

> Now, the rate that must be compounded up to achieve a terminal wealth of $1.21 after 2 years is 10 percent; that is, the expected value of the terminal wealth is given by compounding up the arithmetic, not the geometric mean.[9]

No one should quarrel with the fact that 10 percent is the return which, when compounded over two years, will turn $1.00 into $1.21. But 10 percent is not the average arithmetic return for an increase in wealth from $1.00 to $1.21 over two years; it is the geometric mean! Over two years, the total return was 21 percent, for an average arithmetic return of 10.5 percent. But this includes the effect of compounding, and to get the uncompounded arithmetic return we must compute the geometric mean:

$$\mathbf{r_g} = (1.21/1.00)^{1/2} - 1 = 0.1$$

In other words, while 10 percent is the arithmetic mean which, when compounded, produces the ending wealth value of $1.21, to calculate it from the ending wealth value we have to compute the geometric mean!

The basic failure on the part of the authors of the Ibbotson Associates Yearbook is to frame the issue as if the geometric and arithmetic means were stark contrasts, or total opposites. That is hardly the case. In the context under consideration, the geometric mean is just a special kind of arithmetic mean: an uncompounded arithmetic mean. It is the (uncompounded) arithmetic mean which, when compounded, gives the ending wealth value. Thus, the geometric mean is the appropriate basis for determining the historic risk premium.

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[9] Id., 155.

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